In search of a common ground: Geochemical study of ancient oceanic crust in eastern Luzon, Philippines

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Trace elements and Nd and Sr isotopes data were obtained from pre-Miocene ophiolitic and intrusive rocks in eastern and central Luzon to fingerprint sources and evaluate models for their emplacement. The samples analyzed were taken from the Cretaceous Dibut Bay Ophiolite (DBO) and the basic to intermediate plutonic rocks forming part of the Coastal Batholith and small to medium-sized igneous bodies in the Central Valley Basin. Preliminary results indicate that the sample from Cretaceous Dibut Bay Ophiolite (DBO) possesses lower $^{143}Nd/^{144}Nd$ value for a given $^{87}Sr/^{86}Sr$ value than those obtained from Eocene Angat and Zambales ophiolitic suites (Encarnacion et al, 1999). These results suggest that the Cretaceous DBO may not be related also to the Cretaceous Angat volcanics whose isotopic compositions are similar to the Eocene ophiolitic rocks in the same area and, therefore, of different mantle source. Although the Nd isotopic composition of the DBO are similar to those of the Cretaceous Amami Plateau, and the higher $^{87}Sr/^{86}Sr$ value may be due only to seawater alteration, the La/Sm values tend to be lower than the latter for a given Sm/Yb ratios. This is not consistent with suggestions that the Amami Plateau may have been connected with oceanic crusts of the same age found in some parts of the Philippines. However, these interpretations await confirmation from Pb isotopic and other trace element data. On the other hand, the Nd and Sr isotopic compositions of the intrusive samples fall in the same range as the 43 m.y. old Zambales ophiolite complex, suggesting that their mantle sources were part of the same arc-backarc system which may have lasted from Eocene to Oligocene.

Reference:
Encarnacion et al., (1999), *Chem. Geol*. 156, 343-357.

Chemical and Sr-Nd-Os isotope variations in tholeiitic and alkaline flood basalts from Eritrea: evidence for recycled depleted oceanic crust in the Afar plume.

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The Oligocene flood basalts of Eritrea are part of the Afro-Arabian volcanic province. The Emba Tekera section, the thickest flood basalts section in central Eritrea, with more than fifty-eight flows is divided into Lower (ca. 190 m), Middle (ca. 100 m) and Upper basalt flows (>160 m), each separated by thin pyroclastic deposits. There is a temporal progression from Lower tholeiitic flows characterized by low TiO_2 (0.76-1.62 wt %), toward the Middle and Upper alkaline flows with higher TiO_2 (1.90-3.17 wt %).

The MgO contents vary from 16 to 5 wt. %, but two-thirds of the samples have >8 % MgO, approaching primary melts. Primitive-mantle normalized trace element patterns of all basalts show marked positive Ba anomalies relative to Th, U and Rb. Negative Nb anomalies vanish and become positive upward in the stratigraphy.

Sr and Nd isotope ratios range from 0.7028 to 0.7042 and from 0.51283 to 0.51314 ($\varepsilon(Nd)$ = +3.8 to +9.7), respectively. They display smooth stratigraphic variations from radiogenic to less radiogenic and back to radiogenic, the most depleted Sr-Nd composition being at the base of the Middle basalt flows.

Initial γ_{Os} values (at 30 Ma) for both Lower and Middle basalt flows are indistinguishable and range from +6.9 to +22.4. These initial Os isotope ratios (0.136-0.155), which are near the high end of the OIB range (0.120-0.150), are consistent with their derivation from a mantle plume and show little evidence for interaction with the continental crust. However, the similar initial γ_{Os} values, but lower ε_{Nd} for the Lower basalt flows as compared with the Middle basalt flows, suggest that some magmas from the same plume source were contaminated by subcontinental lithospheric mantle. The Os isotopic composition 0.136-0.148 for the most depleted samples of the Middle basalt flows, $^{87}Sr/^{86}Sr$ of 0.7028-0.7031 and $^{143}Nd/^{144}Nd$ of 0.51314-0.51302 (+7.5 to +9.7 epsilon values) indicate a recycled and strongly depleted oceanic crust component in the Afar plume.